

Pests of Blueberries on São Miguel, Açores, Portugal

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Abstract

In February and March 2006, two plots of 154 plants each of three southern high bush blueberries cultivars (*Vaccinium corymbosum* 'Emerald', 'Jewel', and 'Springhigh') were planted in two locations on São Miguel Island, Açores, Portugal. One plot was planted near the town of Furnas, where the native mountain blueberry *Vaccinium cylindraceum* was also planted, and a second plot, was planted near Calhetas with high bush only. At Calhetas, blueberry plantation establishment was difficult due to heavy soil, high pH and low organic matter, and only 10% of the plans survived. The blueberries at Furnas established well and leaf rust, caused by *Pucciniastrum vaccinii*, was observed. Symptoms included distinct yellow foliar lesions, with brown reddish pustules later in the season. 'Jewel' had the most rust infection, followed by 'Emerald' and 'Springhigh'. Foliar lesions of the rust were not observed on any of the native, *V. cylindraceum* seedlings. This fungal disease exists in other European blueberry growing regions and can be managed with fungicidal sprays. The greenhouse thrips, *Heliothrips haemorrhoidalis* and the light brown apple moth, *Epiphyas postvittana* infested each of the blueberry species and was/were observed at both locations. The heaviest infestation of thrips was observed on plants of native *V. cylindraceum*. The blueberry insect complex in the Azores is not very different from that in other locations where blueberries are grown and corresponding control measures are available.

INTRODUCTION

The Açores Archipelago is located about 1,400 km to the east of Lisbon, Portugal. These islands are strategically located in the mid-Atlantic between North America and Europe. Initially after their discovery in 1432 by Gonçalo Velho Cabral, who was under the allegiance of Henry the Navigator, the islands were given the mission to serve the mother country (Portugal) with commodities and tribute. The Açores became an autonomous region of Portugal in 1976, with Ponta Delgada designated as the capital city.

São Miguel Island was first settled in the late 1430s and 1440s by Portuguese immigrants from Algarve and Minho Provinces (Santos, 2008). Since that time, Madeirans, Moorish, African, French, Italian, Scottish, English, and Flemish people also came to São Miguel bringing with them agricultural commodities to achieve self-sustainability (Santos, 2008). Besides animals and grains, fruit crops including citrus, grapes, figs, pears, apples, peaches, and quinces, were bought to the islands. Pineapples

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are commercially grown in greenhouses near Ponta Delgada and exported to the continent. A special prostrate culturing system for grapes grown in rock cribs was developed. The rocks protect the low-growing vineyards and their fruit from the high winds. While more than 700 commodities have been brought to the islands over the centuries, many have not successfully competed and their cultivation has been halted.

The Açores have a native blueberry (*Vaccinium cylindraceum* Sm.). This shrub resides in the higher elevations (1,000 to 1,500 m) of the entire archipelago, except Graciosa (Borges et al., 2005) and can have flowers and fruit simultaneously during winter. The green leaves of the growing season turn yellow with flame red-orange tinges at the margins after the frosts of fall and winter. The plant has many fruit per raceme and has caught the interest of *Vaccinium* breeders. However this diploid plant is difficult to cross with the tetraploid cultivated blueberry cultivars (Ballington, pers. commun.; Finn, pers. commun.).

Low chilling southern highbush blueberries (*V. corymbosum* hybrids) have been grown successful in Hawaii (Zee et al., 2006; Hummer and Zee, 2007). While many subtropical to temperate crops have been grown in the Açores, the highbush blueberry has not been attempted. Under the Açores Cooperative Initiatives Project (ACIP), at the request of officials in the Direcção de Serviços de Agricultura e Pecuária da Direcção Regional do Desenvolvimento Agrário, two southern adapted highbush blueberry cultivars and a rabbiteye cultivar were brought to São Miguel in February 2006.

The goals of the overall project were to determine if southern adapted North American blueberries would produce yields suitable for market. The objective of this part of the project was to determine what pests and diseases would be encountered in the establishment of blueberries on São Miguel.

MATERIALS AND METHODS

In February and March 2006, two plots of blueberry plants including 18 replicates each of three southern highbush blueberries (*Vaccinium corymbosum* L.) cultivars ('Emerald', 'Jewel', and 'Springhigh') were planted in two locations on São Miguel Island, Açores, Portugal. The blueberries were planted in a randomized complete block design, with six replicates of three plants for each plant type, and guard rows of *Camellia japonica* L. and *Pittosporum undulatum* Vent. in each location. One plot was located near the town of Furnas, where replicates of the native *V. cylindraceum* were also included, and a second plot was located near Calhetas.

Every two weeks the blueberry plants in both field trials were observed for diseases and pests. On each observation date, the number of plants of each blueberry infected with rust, leaf roller, thrips or aphids was recorded.

RESULTS AND DISCUSSION

During the first 2 years leaf rust, leaf roller larvae, thrips and aphids were observed within the blueberry plots. Leaf rust was observed in the Furnas planting, but was not at Calhetas. Symptoms included distinct yellow foliar lesions throughout the growing season, with brown reddish pustules later in the season. 'Jewel' had the most rust infection (Table 1), followed by 'Emerald' and 'Springhigh.' Foliar lesions of the rust were not observed on any of the native mountain blueberry, *V. cylindraceum* seedlings. Other disease, virus, viroid, or phytoplasma symptoms were not observed on any of the plants at either location. In Calhetas the pH was 6.0, which led to chlorotic foliage, weak plant development and death of the majority of the plants.

Several insect pests were observed and identified. Larvae of the leafroller, *Epiphyas postvittana* (Lepidoptera: Tortricidae) attacked each of the blueberry genotypes, including the native mountain blueberry (Table 1), and were present at both locations.

Thrips, *Heliothrips haemorrhoidalis* (Thysanoptera: Thripidae), were noted on each of the genotypes in Furnas, but only a few were observed on 'Emerald' at Calhetas (Table 1). Thrips were not observed on the other two cultivars at Calhetas. At Furnas plants of the mountain blueberry, 'Springhigh' and 'Emerald' had significant infestations;

'Jewel' was infested to a lesser degree.

The cotton aphid, *Aphis gossypii* (Homoptera: Aphididae), infested *V. cylindraceum* and to a minor degree 'Springhigh' and 'Emerald' at Furnas, but only a few were observed at 'Calhetas'.

CONCLUSION

Blueberry leaf rust is a problem in the extreme southern blueberry production areas in Europe and North America where temperatures are warm and humidity is high. In North America, rust is present in the southeastern states of Georgia, Florida, Alabama and Mississippi. Rust was observed in Furnas, which tended to be a foggy city with higher moisture level than Calhetas (Fig. 1). This fungal disease exists in other European blueberry growing regions and does not seem to hamper normal production if properly managed with fungicidal sprays.

While the leaf rollers were observed on each of the blueberries of the study they did not cause significant damage to the leaves and can be managed. The thrips are a more persistent problem. These may cause plant damage, if not controlled, where native blueberries are brought into cultivation.

At this time the blueberries that were imported are certified pathogen-negative and were not infected with viruses. Caruso and Ramsdell (1995) noted that aphids act as virus vectors in blueberries in North America. Should viruses, such as blueberry shoestring or blueberry scorch gain access to the island, the observed aphids might vector these diseases to other blueberries.

The Japanese beetle, *Popillia japonica* Newman is a recently introduced pest which is present on São Miguel, and on other Azorean Islands. This pest could be a future threat to blueberry production on those islands. One potential problem could be the feeding of adult Japanese beetles on ripe fruit.

As suggested in blueberry production guides (Strik et al., 1993) soil acidity, mulching and high organic material are extremely important for establishment and growth of blueberry plants. In São Miguel, windbreaks were important due to the constant winds of the archipelago.

The blueberry insect complex in the Azores is similar to that in other locations where blueberries are grown. The observed insects are manageable and are not expected to cause any major problems in fruit production.

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Tables

Table 1. Mean number of blueberry plants infected with leaf rust aphids, leaf rollers or thrips, at Calhetas and Furnas, on Sao Miguel, Azores, Portugal, sampled between 2007 and 2008.

Blueberry plants	Calhetas			Furnas		
	Leaf rust ²	Aphids ²	Thrips ¹	Leaf rust ⁷	Aphids ⁵	Thrips ⁴
<i>V. corymbosum</i> hybrid 'Emerald'	0.00±0.00	0.00±0.00	0.63±1.19	2.29±4.51b	0.20±0.62c	0.36±0.73c
<i>V. corymbosum</i> hybrid 'Jewel'	0.00±0.00	0.00±0.00	0.00±0.00	4.52±5.56a	0.10±0.31c	0.68±1.29b
<i>V. corymbosum</i> hybrid 'Springhigh'	0.00±0.00	0.11±0.47	0.00±0.00	1.71±3.51c	0.95±1.57b	0.59±1.18b
<i>V. cylindraceum</i>				0.00±0.00d	3.90±4.90a	1.00±1.83a

¹ 8 counting dates

² 18 counting dates

³ 19 counting dates

⁴ 10 counting dates

⁵ 20 counting dates

⁶ 22 counting dates

⁷ 21 counting dates

Figures

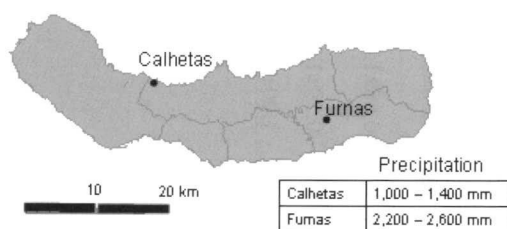


Fig. 1. São Miguel blueberry field locations and mean annual precipitation.